REMARKS

Claims 1-8 and 12-15 are pending.

Claims 1 is an independent claim.

INTERVIEW

The courtesy of the Examiner and Primary Examiner in extending an interview on October 10, 2001, is appreciated. The Interview Summary handed to the undersigned at the interview generally summarizes the interview.

Additionally, each and every rejection based on 35 U.S.C. § 101 and the obviousness type double patenting was discussed by the undersigned who pointed out that the claims could not be viably rejected on double patenting either under 35 U.S.C. § 101 or the obviousness type double patenting.

It was understood that a final decision would be made when the Official Reply was received.

FOREIGN PRIORITY

The acknowledgement of claim for foreign priority is noted.

INFORMATION DISCLOSURE STATEMENT

The indication that the art cited in an Information Disclosure Statement previously filed was considered is noted.

SPECIFICATION

It was requested that the Specification be checked. The Specification has been fully reviewed and editorial changes have been made. No new matter has been presented.

DRAWINGS

The drawings were objected to in the Office Action for the reasons as follows:

(1) The reference character in Figure 7A "201" appeared to duplicate what was shown in Figure 2A, 3, 4A, and 4B. The reference character "201" in Figure 7A, which is prior art, has been cancelled.

(2) The reference signs "3002" and "3003" of Figures 5A and 5B were not mentioned in the description in the Specification. A new paragraph has been added to the Specification to identify these features.

(3) Figures 7A and 7B should be identified by a legend such as "Prior Art".

Accompanying this Reply is a separate Letter for Correcting the Drawings by labeling Figures 7A and 7B as "Prior Art" and removing element "201" from Figure 7A.

The Examiner is requested to approve the drawing changes and corrections.

For the reasons set forth above, the Examiner is requested to reconsider and withdraw the objection to the Drawings.

REPLY TO REJECTIONS

First Rejection

Claims 1, 3, 4, 6, 7, 8, 9, and 11 were rejected under 35 U.S.C. § 101 as claiming the same invention as that of claims 1, 3, 6, 9, 8, 3, 4, and 9 of U.S. Patent No. 6,163,631. It is noted that claims 3 and 9 of that patent were noted twice. This is clearly a typing error in the Office Action. This rejection is traversed as to the remaining claims.

The claims rejected have been amended and are not the "same invention" as in U.S. Patent No. 6,163,631.

The present application and U.S. Patent No. 6,163,631 both disclose two problems, one of which is that an integrated construction formed later has a portion slanting at a junction between a semiconductor layer and a waveguide region, which is an essential feature of the present application.

The other problem disclosed is that the beam diameter of the laser is inconsistent with the fixed mode of the waveguide region, which is an essential feature of U.S. Patent No. 6,163,631, which is absolutely different from that of the present application.

The above feature is defined in the present disclosure and in claim 1 (amended).

The other semiconductor layer is in amended claim 3 related to an element 400 in the embodiment of Fig. 3, the dielectric layer in amended claim 4 relates to an element 600 in the embodiment of Fig. 5, and the further light waveguide region in amended claim 5 relates to arrangement of 200(201), 400(500), 300 in the embodiments Fig. 1 and 2.

If a semiconductor laser having a spot-size of about 1 μm, there occurs a large problem in alignment as shown in the conventional construction of Fig. 7 disclosed in the present application due to a difference of spot size. An object of the present application is to provide a part or a portion having a spot size converting function between the semiconductor laser and light fiber. For instance, a semiconductor laser device having a semiconductor laser and a spot-size converter as shown in the embodiment of Fig. 2 of the present application, having a construction of 201 and 500 which is not coupled to a light waveguide region. Accordingly, the amended claims are totally different from the claims of U.S. Patent No. 6,163,631.

As can be seen, claim 1 differs from the claims in the patent and is not claiming "the same invention" which would necessitate a rejection under 35 U.S.C. § 101. See, for example, the explanation of this in MPEP § 804 (II and IIA). Also, the claimed structure is not suggested.

For the reasons set forth above, the Examiner is requested to reconsider and withdraw the rejection of the claims under 35 U.S.C. § 101.

Second Rejection

Claims 12-15 were provisionally rejected under 35 U.S.C. § 101 as claiming the same invention of that of claims 13, 13, 15, and 15, respectively of copending Application No. 09/645,102. It is noted that the claims 13 and 15 were repeated twice. This is understood to be a typographical error on the part of the Patent Office. This rejection is traversed.

Claims 12-15 originally depended on claims 1, 8, 13, and 7, respectively. As these claims are dependent claims, they so include the subject matter of their base claims. As the base claims were not rejected on the claims of Application No. 09/645,102, there is no viable basis for a rejection under double-patenting under 35 U.S.C. § 101 as dependent claims include all limitations of their base and intervening claims.

Additionally, claims 12-15 now depend from claims 1, 1, 13, and 1, respectively. Accordingly, a rejection under 35 U.S.C. § 101 would not apply because the Patent Office did not consider the base claims and intervening claims rejectable under claims 13 and 15 of Application No. 09/645,102.

For the reasons set forth above, the Examiner is requested to reconsider and withdraw the rejection under 35 U.S.C. § 101.

Third Rejection

Claims 2, 5, and 10 were rejected under the judicially created Doctrine of Obviousness Type Double-Patenting as being unpatentable over claims 1, 7, and 7, respectively of U.S. Patent No. 6,163,631 in view of Stein. It is noted that claim 7 was repeated twice in the Office Action. This is understood to be a typographical error on the part of the Patent Office. This rejection is traversed as to the remaining claims.

Claims 2 and 5 depend on claim 1. As explained in the reply to the first rejection, claim 1 is not the same invention as in U.S. Patent No. 6,163, 631. The addition of Stein does not cure the inherent deficiencies in the rejection based on U.S. Patent No. 6,163,631 even though an obvious type rejection was used.

For the reasons set forth above, the Examiner is requested to reconsider and withdraw the rejection of the claims under the obviousness type of double-patenting.

CONCLUSION

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Elliot A. Goldberg (Reg. No. 33,347) at the telephone number of (703) 205-8000, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a two (2) month extension of time for filing a reply in connection with the present application, and the required fee of $390.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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TCB/EAG/dp

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

The paragraph beginning on page 1, line 11, has been amended as follows:

Multimedia technologies which have been rapidly developing are likely to enable high-speed, high capacity optical communications (the data transfer rate of which may be 100 Mbps or more) at home as well as at the office in the near future. Among the technologies, the Fiber-To-The-Home (FTTH) is a promising technology which extends an optical fiber from the trunk line to home. In this technology, the output light of a semiconductor laser is required to be introduced into an optical fiber. However, a typical semiconductor laser has its output light of [the] a spot size (about 1 μm) that is largely different from [the] a spot size of a single-mode optical fiber (about 10 μm). For this reason, when the semiconductor laser is directly connected with the optical fiber, a great insertion loss is generated due to mode mismatch.

The paragraph beginning on page 2, line 3, has been amended as follows:

The small spot-size of the semiconductor laser gives rise to [such] a problem that a very small displacement of the spot leads to a great increase in the insertion loss. For example, an about 1 μm displacement between the semiconductor laser and the optical fiber may generate as much as a 10 dB excess loss. To solve this problem, a semiconductor laser with a spot-size converter is considered in which a light waveguide having a larger spot-size than that of a semiconductor laser is integrated along with the semiconductor onto the same substrate.

IN THE CLAIMS

Claims 9-11 have been cancelled.

The claims have been amended as follows:

1. (Amended) A semiconductor laser device with a spot-size converter, comprising:

[at least:

a semiconductor laser region emitting light from an end facet thereof; and

a light waveguide region,

wherein the semiconductor laser region and the light waveguide region are integrated on a semiconductor substrate in a horizontal direction; and

a semiconductor layer is buried in a junction region between the semiconductor laser region and the light waveguide region]

a semiconductor substrate having a semiconductor laser region and a semiconductor layer thereon,

wherein the semiconductor layer is the spot-size converter, and the refractive index of the semiconductor layer varies in a layer direction continuously or in a stepwise manner.

2. (Amended) A semiconductor laser device with a spot-size converter according to claim 1, wherein [the refractive index of the semiconductor layer is substantially uniform]

the semiconductor layer is formed such that a region having the highest refractive index is substantially consistent with a central portion of light distribution emitting from the semiconductor laser region.

3. (Amended) A semiconductor laser device with a spot-size converter according to claim 1, wherein [the refractive index of the semiconductor layer varies in the layer direction continuously or in a stepwise manner]

another semiconductor layer is provided on a boundary plane between the semiconductor laser region and semiconductor layer, and the refractive index of the another semiconductor layer in approximately constant.

4. (Amended) A semiconductor laser device with a spot-size converter according to claim 1, wherein a dielectric layer is provided on a boundary plane between the semiconductor laser region and semiconductor layer [3, wherein a region having the highest refractive index of the semiconductor layer is registered with a substantially central portion of a profile of light emitted from the semiconductor laser region as well as a substantially central portion of the inherent mode of the light waveguide region].

5. (Amended) A semiconductor laser device with a spot-size converter according to claim 1, wherein the semiconductor laser device having a spot-size converter includes a further light waveguide region at an opposite side of the semiconductor laser region facing to the semiconductor layer [3, wherein a second semiconductor layer is provided between the semiconductor layer and at least one of the semiconductor laser region and the light waveguide region, the refractive index of the second semiconductor layer being substantially uniform].

6. (Amended) A semiconductor laser device with a spot-size converter according to claim 2, wherein the semiconductor laser device having a spot-size

converter includes a further light waveguide region at an opposite side of the semiconductor laser region facing to the semiconductor layer [3, wherein a dielectric layer is provided between the semiconductor layer and at least one of the semiconductor laser region and the light waveguide region].

7. (Amended) A semiconductor laser device 3, wherein the semiconductor laser device having a spot-size converter includes a further light waveguide region at an opposite side of the semiconductor laser region facing to the semiconductor layer [with a spot-size converter, comprising at least:

a semiconductor laser region emitting light from an end facet thereof; and

a light waveguide region,

wherein the semiconductor laser region and the light waveguide region are interested on a semiconductor substrate in a horizontal direction; and

a dielectric layer is buried in a junction region between the semiconductor laser region and the light waveguide region].

8. (Amended) A semiconductor laser device with a spot-size converter 4, wherein the semiconductor laser device having a spot-size converter includes a further light waveguide region at an opposite side of the semiconductor laser region facing to the semiconductor layer [, comprising at least:

a semiconductor laser region emitting light from an end facet thereof; and

a semiconductor layer,

wherein the semiconductor laser region and the semiconductor layer are integrated on a semiconductor substrate in a horizontal direction; and

the refractive index of the semiconductor layer varies in a layer direction continuously or in a stepwise manner].

13. (Amended) A method for fabricating the semiconductor laser device with a spot-size converter of claim [8] 1 comprising at least a semiconductor laser region emitting light from an end facet thereof and a semiconductor layer wherein the semiconductor laser region and the semiconductor layer are integrated on a semiconductor substrate in a horizontal direction,

the method comprising the steps of:

forming a semiconductor multilayer functioning as the semiconductor laser region on the semiconductor substrate;

removing part of the first semiconductor multilayer by etching to have a substantially vertical cross-section thereof; and

forming the semiconductor layer in the etched region.

15. (Amended) A method for fabricating the semiconductor laser device with a spot-size converter of claim [7] 1 comprising at least a semiconductor laser region emitting light from an end facet thereof and a light waveguide region wherein the semiconductor laser region and the light waveguide region are integrated on a semiconductor substrate in a horizontal direction,

the method comprising the steps of:

forming a first semiconductor multilayer functioning as the semiconductor laser region on the substrate;

removing part of the first semiconductor multilayer by etching to have a substantially vertical cross-section thereof;

forming a dielectric layer on a side of the etched region; and

forming a second semiconductor multilayer functioning as the light waveguide region in the etched region.